Amended claim 1 recites that the at least on cladding region is the n-doped cladding region. Therefore, the optical confinement layer is provided *between the active region and the n-doped cladding region*. An advantage of such feature is that when electrons are injected from the n-doped cladding region into the active region they will pass through the optical confinement region. In doing so, the electrons will be "cooled", and thus will reduce carrier heating effects. (See, e.g., Spec., p. 8, 2nd para.)

As previously pointed out by applicant and admitted by the Examiner, *Hayakawa* does not include an optical confinement layer.

Hiroyama discloses an optical confinement layer, but does not teach providing the optical confinement layer *between* the n-doped cladding layer and the active layer. *Hiroyama* discloses a device in which the optical confinement layer 10 is *above* both the cladding layers 3, 7 and the active layer 5. (See, Fig. 1).

Further, *Hiroyama* describes that the optical confinement layer 10 has an optical confinement function and a *current blocking function*. (Col. 9, lns. 33-34).

However, *Hiroyama* does not teach or suggest providing an optical confinement layer between the n-doped cladding layer and the active layer such that electrons will be "cooled" as the pass from the n-doped cladding region into the active region via the optical confinement region.

Since the optical confinement layer 10 of Hiroyama functions as a current blocking layer, then *Hiroyama* teaches away from the provision of an optical confinement layer in which electrons are allowed to pass from the n-doped cladding layer to the active layer.

Therefore, a person having ordinary skill in the art would not be motivated to (1) change the position of the optical confinement layer of *Hiroyama* to the position as claimed in the present invention, and also (2) provide an optical confinement layer that is not a current blocking layer, but allows the electrons to pass as in the present invention.

Withdrawal of the rejection of claim 1 and the claims dependent therefrom is respectfully requested for at least the above basis alone.

Furthermore, applicant respectfully resubmits below the arguments set forth in applicant's previous response. In the event the Examiner contemplates issuing another non-favorable Office Action, ***Applicant hereby requests that the Examiner contact the undersigned in order to conduct an interview prior to issuing such an Office Action***. The undersigned would like an opportunity to discuss in detail the basis of the Examiner's rejection in view of the comments provided herein.

i. Applicant's Invention

As previously noted, claim 1 defines a laser device which further includes at least one optical confinement layer *with a lower refractive index than the cladding regions and disposed between the active region and at least one of the cladding regions*. None of the references taken alone or in combination teach or suggest such feature.

An advantage of a laser device in accordance with the present invention, that is a laser device which further includes at least one optical confinement layer *disposed between the active region and at least one of the cladding regions*, is improved optical confinement may be achieved. By providing an optical confinement layer with a lower refractive index than the cladding regions, wherein the confinement layer is disposed between the active region and at least one of the cladding regions, improved optical confinement may be achieved. This thereby reduces the penetration of the optical field into the cladding region beyond the optical confinement region and concentrates the optical field in the active region.

Such effects will reduce the threshold current of the laser device. Furthermore, reducing the penetration of the optical field into the cladding region will improve the circularity of the far field image. (See, e.g., Spec., p. 7, last paragraph to p. 8, first paragraph).

ii. The Examiner's Response

The Examiner maintains the rejection under 35 USC §103(a) based on *Hayakawa* in view of *Hiroyama et al.* Beginning on page 9 of the Office Action, the Examiner responds to applicant's arguments distinguishing the present invention.

Based on applicant's review of th application and the Examiner's comments, it appears the Examiner may have not fully appreciated the distinction which applicant was arguing.

The Examiner states at the bottom of page 9 "applicant argues that the Prior Art does not teach or suggest that the confinement layer width (*sic*) a lower refractive index than the cladding regions." However, applicant did not argue simply that the Prior Art does not teach or suggest a confinement layer with a lower refractive index than the cladding regions. Rather, applicant argued that the references did not teach or suggest an optical confinement layer which *both (i)* has a refractive index lower than the cladding regions; and *(ii)* is disposed between *the active region and at least one of the cladding regions* (See, e.g., Response mailed October 31, 2002, page 4).[1]

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[1]Applicant pointed out in the previous response: "The Examiner admits that *Hayakawa* does not teach a layer with a low refractive index. However, the Examiner contends it would have been obvious to combine the teachings of Hiroyama insofar as including an optical confinement layer having a smaller refractive index than the cladding layer (See, e.g., abstract).

Applicant notes, on the other hand, that *Hiroyama et al.* describes a laser device. As is shown in Fig. 1, an n-type cladding layer 3 and a p-type cladding layer 7 are disposed on opposite sides of an active layer 5 positioned between guiding layers 4 and 6. The device further includes a confinement layer 10 which is disposed on top of the p-type cladding layer 7.

Hiroyama et al. describes the optical confinement layer 10 as having a refractive index which is smaller than the p-type cladding layer 7. (See, e.g., column 9, lines 55-64). Applicant notes in this case, however, that the optical confinement layer in *Hiroyama et al.* is *not* located between the active region 5 and one of the cladding layer (e.g., 7). Thus, *Hiroyama et al. does not teach or suggest a confinement layer having a lower refractive index than that of the cladding region and located between the active region and the cladding region as recited in claim 1 of the present application.*

Thus, there is a structural distinction between the present invention and the device described in *Hiroyama et al.* In this sense, *Hiroyama et al.* is similar to *Hayakawa* in that neither reference teaches an optical confinement region *disposed between the active region and at least one of the cladding regions and having a lower refractive index than the at least of the cladding regions* as recited in claim 1. Both *Hayakawa* and *Hiroyama et al.* teach that the refractive index of a confinement region located between the active region and the cladding region is greater than or equal to the cladding region as argu d in applicant's previous response. (See, .g., page 5).

Consequently, *Hiroyama et al.* does not make up for the deficiencies of *Hayakawa* with respect to claim 1. Withdrawal of the rejection in relation to claim 1 is

The Examiner did not address applicant's arguments that the references do not teach such a confinement layer *located between the active region and the cladding region* as recited in claim 1. The Examiner further failed to respond to applicant's argument that *both Hayakawa* and *Hiroyama et al.* teach that the refractive index of a confinement region located between the active region and the cladding region is *greater than or equal to the cladding region*, which is completely opposite the present invention as recited in claim 1.

Accordingly, the rejection should be withdrawn. Both *Hayakawa* and *Hiroyama et al.* fail to teach or suggest an optical confinement layer which *both (i)* has a refractive index lower than the cladding regions; and *(ii)* is disposed *between the active region and at least one of the cladding regions.*

In summary, *Hayakawa* does not even describe a layer such as the optical confinement layer of the present invention, i.e., that has a lower refractive index than the n-doped cladding region and the p-doped cladding region. Therefore, there is no motivation whatsoever towards providing such a confinement layer so that it is disposed between an active region and at least one of the cladding regions.

Hiroyama et al. does describe an optical confinement layer with a lower refractive index than the cladding layers; however, *Hiroyama et al.* does not teach or suggest disposing the optical confinement layer between the active region and the cladding region, as in the present invention. In contrast to the present invention, *Hiroyama et al.* teaches positioning an optical confinement layer *above both the cladding layers and also above the active layer.*

Thus, even assuming for sake of argument alone that it would have been obvious to specify that a confinement region could have a lower refractive index as shown by *Hiroyama et al.* for the purpose of having good characteristics as shown in *Hayakawa*, as asserted by the Examiner, there is still no teaching or suggestion in either reference for disposing the confinement layer between the active region and at

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respectfully r quested."

least one of the cladding regions as recited in claim 1. The claims dependent from claim 1 may be distinguished for at least the same reasons.

Accordingly, withdrawal of the rejection is respectfully requested.

III. REJECTIONS OF CLAIMS 3, 5-7 AND 13-17 UNDER 35 USC §103(a)

Claims 3 and 5 are rejected under 35 USC §103(a) based on *Hayakawa* in view of *Kidoguchi et al.* Claims 6 and 7 are rejected 35 USC §103(a) based on *Hayakawa* in view of *Copeland*. Claims 13-17 are rejected under 35 USC §103(a) based on *Hayakawa* in view of *Hiroyama et al.* Each of these rejections is respectfully traversed for at least the following reasons.

Regarding these dependent claims and the secondary/tertiary references, none of such references make up for the deficiencies in *Hayakawa* and *Hiroyama et al.* Thus, withdrawal of the rejections is respectfully requested.

IV. CONCLUSION

Accordingly, all claims 1-7 and 9-31 are believed to be allowable and the application is believed to be in condition for allowance. A prompt action to such end is earnestly solicited.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Serial No.: 09/501,947

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account No. 18-0988.

Respectfully submitted,

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May 28, 2003
DATE

Serial No.: 09/501,947

Appendix

IN THE CLAIMS:

Claim 1 has been amended as follows:

1. (Twice Amended) A laser device comprising: an n-doped cladding region and a p-doped cladding region; an optical guiding region disposed between the n-doped cladding region and the p-doped cladding region; and an active region disposed within the optical guiding region;

wherein the laser device further comprises at least one optical confinement region disposed between the active region and at least one of the cladding regions, the at least one optical confinement region having a lower refractive index than the at least one of the cladding regions, ~~and~~

~~wherein~~ the laser device emits light in the visible region, and

the at least one cladding region is the n-doped cladding region.